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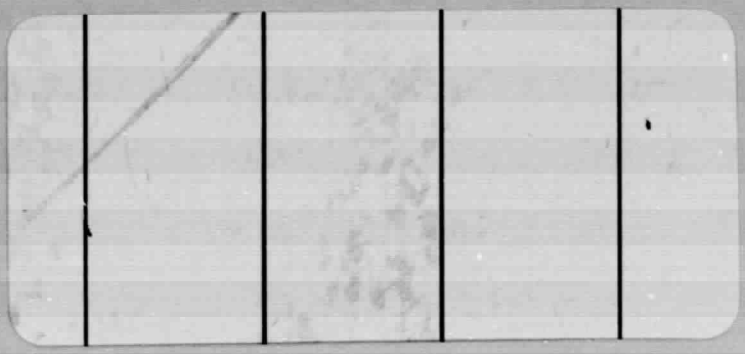

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Retransmission of Hydrometric Data in Canada

SR 28190

Applied Hydrology Division
Department of the Environment
Ottawa, Ontario, Canada
K1A 0E7

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Quarterly Report for Period January-March 1977

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14. Supplementary Notes Prepared by I.A. Reid and R.A. Halliday		

15. Abstract

Data Collection Platforms have been installed at sites in remote areas of Canada for transmittal of water level and other water resources data. The near real-time data are used for water management purposes. The system has met all requirements and demonstrates the suitability of transmitting hydrometric data by satellite. The installation of the Landsat/GOES DCS downlink at the Prince Albert, Saskatchewan Satellite Station scheduled for completion in May 1977 is proceeding as planned.

I. INTRODUCTION

The Water Survey of Canada operates over 2 400 hydrometric stations at which water level data are collected. Because of the isolated locations of many of these stations, it usually is not economically feasible to telemeter data from the sites by conventional means. For this reason an experiment was conducted which involved transmitting data from nine sites by means of Landsat 1. The technical suitability of the system was demonstrated and in response to a demand for near real-time data from additional sites, it was decided to implement a larger network. In this way, it should be possible to determine the benefits and costs associated with a larger operational system.

II. TECHNIQUES

Data Collection Platforms have now been installed at 24 sites. An additional 5 DCPs may be installed in 1977. The sites (Figure 1, Table 1) were selected on the basis of real time data needs for water management purposes. Water level data are transmitted from all sites while additional parameters, mainly meteorological data, are transmitted from some sites.

Water levels are sensed at Water Survey of Canada gauging stations by a float and pulley or by a servomanometer that senses the static pressure in a nitrogen purge system. Water level is usually recorded on a strip chart recorder. At those stations where DCPs are installed, an analogue to digital shaft position encoder (the Stevens Memomark II) is used to encode and store 16 bits (4 BCD digits) of water level data for transmittal by the DCP.

Precipitation data are obtained using a Fisher and Porter weighing type precipitation gauge. The gauge can be equipped with a Telekit for telemetering of data. The gauge is connected to a serial digital interface designed by Atmospheric Environment Service, (AES) Department of the Environment. The interface is known as a Hydrometeorological Automatic Recording and Telemetering System (HARTS). Air temperature in the HARTS system is sensed by a platinum resistance bulb thermometer. A precision thermistor (YSI 44033) connected directly to the DCP is also used in some other cases. Recently AES relocated one of their two HARTS units to a meteorological site.

The data transmitted by DCPs are processed by NASA, then sent to Canada in two ways. The first is by land line to the Canada Centre for Remote Sensing in Ottawa. The data usually arrive shortly after each orbit of the spacecraft. At CCRS the

FIGURE 1

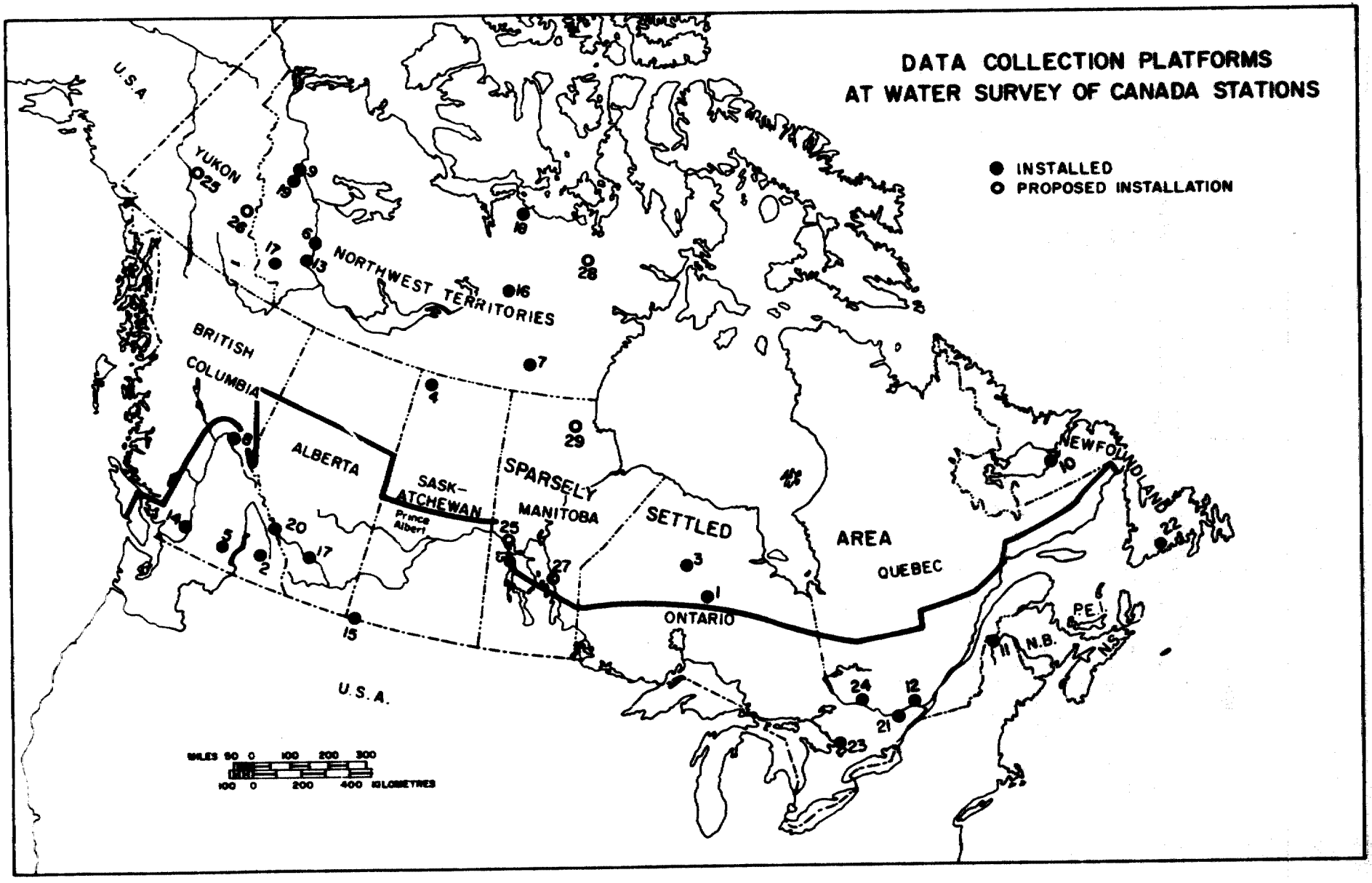
DATA COLLECTION PLATFORMS
AT WATER SURVEY OF CANADA STATIONS
INSTALLED
PROPOSED INSTALLATION
U.S.A.
YUKON
NORTHWEST TERRITORIES
BRITISH COLUMBIA
ALBERTA
SASK-ATCHEWAN
Prince Albert
MANITOBA
SPARSELY SETTLED AREA
ONTARIO
QUEBEC
NEWFOUNDLAND
P.E.I.
N.B.
N.S.
U.S.A.
MILES 50 0 100 200 300
100 0 200 400 KILOMETRES

TABLE 1

LOCATION OF DATA COLLECTION PLATFORMS

	INSTALLED AT HYDROMETRIC STATIONS	DATE INSTALLED	DCP	LAT.	LONG.
1)	Albany River above Nottik Island	Jan 13, 73	6102	51° 38'	86° 24'
2)	Carney Creek below Pambrun Creek	Mar 25, 75	6126	50° 10'	116° 35'
3)	Winisk River at Kanuchuan Rapids	Sept 27, 74	6137	52° 58'	87° 42'
4)	Lake Athabasca at Crackingstone Point	Sept 19, 72	6150	59° 23'	108° 53'
5)	Snow course No. 5A Mission Creek	Oct 31, 75	6232	49° 57'	118° 55'
6)	Mackenzie River near Wrigley	June 7, 73	6260	63° 16'	123° 36'
7)	Kazan River at Outlet of Ennadai Lake	Sept 19, 72	6353	61° 16'	100° 58'
8)	McGregor River at Lower Canyon	July 26, 76	6354	54° 16'	121° 40'
9)	Mackenzie River at Sans Sault Rapids	May 31, 73	6366	65° 46'	128° 45'
10)	Churchill River at Muskrat Falls	Aug 7, 75	6502	53° 15'	60° 47'
11)	St. Francis River at Outlet of Glasier Lake (GOES mode)		6504	47° 12'	68° 57'
12)	Rouge en amont de la Chute McNeil	Mar 8, 77	6511	45° 44'	74° 41'
13)	Root River near the Mouth	July 15, 75	6512	62° 29'	123° 26'
14)	Nahatlatch River below Tachewana Creek	Oct 20, 75	6514	49° 57'	121° 52'
15)	Battle Creek at International Boundary	Oct 22, 75	6541	49° 00'	109° 25'
16)	Hanbury River above Hoare Lake	July 5, 76	6547	63° 36'	105° 09'
17)	South Nahanni River above Virginia Falls	July 15, 75	6572	61° 38'	125° 48'
18)	Ellice River near the Mouth	Apr 22, 76	6507	67° 42'	104° 08'
19)	Mountain River below Cambrian Creek	May 7, 76	6542	65° 14'	128° 34'
20)	Ridge of Mount Rhondda above Peyto Glacier	Oct 6, 76	6517	51° 38	116° 33'
21)	Rideau River at Ottawa Test Site (now in operation in the GOES mode)		6521	45° 23'	75° 42'
22)	Grey River near Grey River	Sept 13, 76	6210	47° 45'	56° 56'
23)	Severn River above Wasdell Falls	Sept 14, 76	6524	44° 46'	79° 18'
24)	Dumoine a la sortie du Lac Robinson	Mar 16, 77	6574	46° 20'	77° 49'
	PROPOSED				
25)	Pelly River at Pelly Crossing		6501	62° 50'	136° 35'
26)	South MacMillan River at Mile 249 Canal Road		6522	62° 55'	130° 32'
27)	Lake Winnipeg at Berens River		6527	52° 21'	97° 00'
28)	Back River below Deep Rose Lake		6544	66° 05'	96° 30'
29)	Seal River below Great Island		6571	58° 54'	96° 17'

data are recorded simultaneously on a teletype hard copier and on magnetic tape. A software data retrieval system sorts the user platforms, reformats the data into engineering units and stores individual user files on disk. The user may then access the data file, usually daily, using either a teletype or telex remote terminal.

The second way that data are received from NASA is by punched card and uncalibrated computer listings about two weeks after transmittal by the DCP. These data are delivered to the Canadian Embassy in Washington, D.C., then carried by diplomatic bag to the Department of External Affairs in Ottawa. External Affairs then mails the data to the user. The cards are run in computer programs that sort the data and perform the conversion to engineering units. Data produced in this way are used to generate statistics on DCP performance, for quality checks and for archival purposes.

III. ACCOMPLISHMENT

DCPs 6511 and 6574 were checked and tested in the Instrumentation Section, Glaciology Division shop prior to installation on the Rouge en amont de la Chute McNeil and the Dumoine a la sortie du Lac Robinson rivers in the Province of Quebec. Water level readings from these two key rivers, are used in the Streamflow Synthesis and Reservoir Regulation (SSARR) of the Ottawa River watershed.

DCP 6574 is equipped by the Instrumentation Section with a YSI temperature sensor, a battery voltage sensor and a small solar panel. DCP 6511 transmits water level readings only.

The Instrumentation Section also repaired DCPs 6501 and 6522 for installation in the British Columbia and Yukon Territory District.

DCP 6504 was converted to the GOES mode and installed on the St. Francis River at Outlet of Glasier Lake, tributary to the Saint John River for the Atlantic Provinces District. The Saint John River has been selected for study by the WMO's World Weather Watch (WWW). The St. Francis River data are also used in a SSARR model of the Saint John River basin.

DCPs 6527 and 6571 were repaired and shop tested in the Landsat and GOES mode under contract by Ball Brothers Research Corporation, Boulder, Colorado. These DCPs will be field tested from our Bow River below Carseland Dam site prior to permanent installation.

Table 2 is a summary of the data retransmitted for Landsat cycles 39 to 43 inclusive covering the period December 29, 1976 to March 28, 1977. During this period 11 476 messages were processed. The relatively few transmissions are due to fewer DCPs being on the air during the winter.

The installation of the Landsat/GOES data collection system downlink at the Prince Albert Satellite Station scheduled for completion in May 1977 is progressing as planned.

IV. SIGNIFICANT RESULTS

The project continues to demonstrate the feasibility of transmitting hydrometric data to polar orbiting spacecraft and using these data operationally. All elements of the system are functioning well.

Platform 6137 is powered by Cipel and Le Carbone Type 321 J air-depolarized primary cells. During the winter of 1974-75 the number of transmissions dropped with lower temperatures and ceased at -20°C. During the winter of 1975-76 the same pattern occurred except that the platform ceased at slightly lower temperatures, probably due to the addition of 3, 1.5 V primary cells to the power supply. The same pattern occurred during the winter of 1976-77 as occurred during the winter of 1975-76. Table 2 in the previous and this quarterly report shows the daily mean transmissions during the winters of 1975-76 and 1976-77.

V. PUBLICATIONS

On March 18, 1977, R.A. Halliday presented a paper entitled "Hydrologic Data Relay by Satellite From Remote Areas" to the Technical and Scientific Sessions on Water Resources, World Water Conference, Mar del Plata, Argentina.

On April 22, 1977, I.A. Reid presented a paper entitled "Hydrologic Applications of the TIROS-N Argos Data Collection System" by R.A. Halliday and I.A. Reid to the first Argos users working group meeting, Washington, D.C.

VI. PROBLEMS

No serious problems during this report period.

VII. DATA QUALITY AND DELIVERY

Same as outlined in the previous quarterly report.

VIII. RECOMMENDATIONS

To continue operating the Landsat DCS system.

TABLE 2

SUMMARY OF RETRANSMITTED DATA - DEC. 29, 1976 TO MAR. 28, 1977

Daily Mean Transmissions per cyle for cycles 39 to 43 (Landsat-2)

(Transmissions received simultaneously at two or more sites are counted only once)

Platform	39	40	41	42	43	Daily Max.	Daily Min.	Total
6102	4 (18)	4 (18)	6 (18)	7 (18)	7 (18)	11	2	519
6137	8 (9)	10 (18)	11 (18)	13 (18)	15 (18)	18	1	946
6150	25 (18)	24 (18)	26 (18)	25 (18)	24 (18)	31	19	2,220
6210	5 (20)	5 (18)	6 (18)	6 (18)	5 (18)	9	1	498
6232	14 (18)	13 (18)	14 (18)	14 (18)	14 (18)	20	8	1,242
6353	29 (18)	28 (18)	31 (18)	29 (18)	30 (18)	36	19	2,632
6354	9 (18)	8 (18)	8 (18)	10 (18)	8 (18)	16	1	782
6501	2 (8)	-	6 (4)	10 (3)	7 (8)	13	1	122
6502	5 (7)	4 (6)	5 (7)	6 (11)	6 (18)	11	1	271
6504	13 (11)	13 (3)	7 (6)	3 (2)	-	18	2	233
6511	-	-	5 (2)	14 (3)	13 (18)	17	1	281
6514	8 (18)	7 (18)	5 (18)	5 (18)	6 (18)	13	1	546
6522	-	-	-	-	1 (11)	1	1	11
6524	10 (18)	10 (18)	10 (18)	9 (18)	9 (18)	15	5	864
6541	6 (2)	-	1 (1)	10 (3)	3 (7)	14	1	67
6574	-	-	11 (3)	9 (4)	10 (17)	14	5	242
								11,474

Brackted numbers indicate number of days in cycle used to calculate mean